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for this purpose, but has no notes of species feeding beneath the ground. Harris was of the opinion that the Striped Cucumber-beetles, in the larval state, fed on the roots of plants, but was never able to find them. I have demonstrated, many years ago, that they feed on the roots of melon, cucumber, squash, and pumpkin vines, and ever since I attempted to raise any kind of vine, my greatest trouble has been *not to find them*.

The Chrysomelians, probably, as a rule, feed on the leaves of plants in the larval state, but in my limited researches I have found the majority of them beneath the ground. According to undisputed authority, they often congregate together in great numbers, and do great injury to the leaves of plants, even so as to compare with the ravages of caterpillars. I myself have observed some of this work.

As the Cucumber-beetle exclusively raises its young on the roots of the Cucurbitaceous (gourd) family, so from these observations I am led to believe from analogy, that the Striped Turnip-beetle raises its young always on the roots of the Cruciferous (mustard) family.

FERNs.*

BY JOHN L. RUSSELL.

THE revelations of the science of geology have made it evident that in the early periods of the earth's history, especially in the formation of the coal beds, the ferns and their immediate allies formed no inconspicuous feature in the vegetation, and that the diminished and dwarfed forms of the present day represent the arborescent ones of that time. But what the present flora may have lost in majesty of size, it has gained in greater variety, and of the elegant and graceful

*A Fern Book for Everybody, containing all the British Ferns, with the foreign species suitable for a Fernery. By M. C. Cooke. Small 8vo, pp. 124. London, 1867.

proportions of many of the modern species, there are few or no traces in the past.

The interest which thus attaches to a fossil impression of an ancient fern, so exquisitely preserved that the venation of the frond (leaf) can be studied as a distinctive character, as well as in a fresh living specimen, cannot fail to render the whole family objects of attention, and help to induce a great many people, both old and young, to know something of its natural history. A taste for ferns has gradually sprung up and extended itself of late, and not a few have become enthusiastic botanists in this single speciality. Others have sought their cultivation as objects of special beauty; and floriculture has not deemed it beneath its domain to introduce them into artistic gardening. The delicate and tender foliage of some species, the fading tints of pale and tender golden yellow on their ripening in autumn, the evergreen lustre of others through snow, frosts and cold of winter, the curious capsules of others, or the grotesque variations of shape in stem and pinnated fronds of still others, have elicited admiration and interest. Wonderfully adapted to the artificial rock-work of picturesque gardening, and enduring, with a becoming hardihood, the changing character of so fitful a climate as ours, many of them, some even of foreign origin, claim the regard of the amateur cultivator. Others more tender and delicate, small and graceful, and of petite proportions, thrive under the ample bell-glass, or in the Wardian case, and help to enliven the parlor window in the wintry season of the year. Rich and costly collections of the fern plants occupy glass structures built expressly for them, and are more attractive in such luxuriance than far more specious and gaudy flowering plants. For it is, doubtless, familiar to the reader that the ferns stand at the head of a very large number of vegetable forms, which can boast of no flowering apparatus, to which neither involucre, nor sepal, neither petal nor stamen, neither pistil nor germen belong! They are the princes of the flowerless realm of

nature, provided with a singularly contrived apparatus, which but faintly and obscurely foreshadows the floral organs of other plants.

It were to be supposed that these plants, so common and widely distributed, would be known to everybody, growing as they do out of the crevices of rocks, springing up in the uncultivated fields, forming immense beds of growing and picturesque vegetation in the pastures, hiding the ground in the swamps, delighting the eye by their tender beauty in early spring, sprouting out in little graceful tufts from the stone walls, nodding and beckoning to their shadows as they are reflected in the water of the shady and cool well, or dipping into the pool or brook, but I have met with those who did *not* know what a fern was, even under its most familiar aspect. For such involuntary or willing ignoramuses, as well as for those who do know something and would know more of the ferns, the little work by Mr. Cooke, is specially and carefully prepared, and is what it purports, a "Fern Book for Everybody;" and well were it if everybody would learn from its humble and unpretentious pages what they can teach: something and enough at least to find the ferns are worth knowing. "It only professes to be a plain and easy guide to the study or cultivation of plants well known, and often described before, hence it contains nothing sensational or new, unless it be an increased effort to be plain and popular, so that persons who know nothing of the science of botany, or its technicalities, may learn something about ferns. Whilst all the British species are described and figured, and hints given for their cultivation, a number of hardy foreign species are also introduced at the close," etc. As several of the genera are common both to Great Britain and to New England, and some species likewise, the figures will materially aid any novice who seeks a cheap and reliable book for his first studies. This point will be farther considered in the succeeding remarks of the present notice.

The ferns are furnished with roots, horizontal or else upright stems, leaves technically called *fronds*, because they are not veritable leaves, and which usually rise from the ground curled up compactly, and gradually uncurling or unfolding and expanding laterally and longitudinally, while on the backs of them little pustules, or else uncovered spots filled or packed with a fine dust, are seen. Almost everybody supposes these dust-like heaps are the *seeds*, but the magnifying lens show that each particle of dust is a curious little casket, or box, or pocket, held together by a jointed and elastic ring. There are many modifications of this arrangement, but in a vast number of instances such is the normal rule. When sufficiently mature and ripe, the ring bursts, and the finer dust is thrown out of the little pocket. Each of these grains of finer dust is, in effect, a small living bud or bulb, and if sown on moist earth, or even on a piece of moistened sandstone, wetted window glass or sandy soil, will soon vegetate and grow, and produce a little dark green thin scale, deeply divided on one side, and when magnified it will be found to be a mesh-work of delicate cells. This scale is called the *prothallus*, and is totally unlike any organ in the higher plants. The prothallus on having obtained its full growth, will have attached itself to the soil or substance on which it has grown, by tufts of minute roots, and in one or more of its tiny cells, a sort of bud has been formed, which presently protrudes itself from its mother cell to meet little bristly-threaded filaments, which are endowed with motion, and which have issued from other nourishing cells on the same prothalline scale. After uniting, the first-named bud or buds grow into tiny stems, having roots of their own, when the scale or prothallus perishes, the young fern pushing forth its leaves, at first very small and unlike the subsequent and normal ones. In a year or more (perhaps even many years) the fronds assume sufficient strength, vigor and size, to make the pustules and heaps of dust on their backs, and the cycle of existence is complete. This

process, which I have often witnessed, is the only blossoming of the fern. It may grow for centuries and become an arborescent kind, such as formerly grew in the Coal periods, and such as now grow in the Sandwich Islands and at the Isthmus of Darien, *but no other blossom or flower appears!*

The dust of rare and valuable ferns collected in foreign countries, and kept closely sealed in phials from the dryness or moisture of the outward atmosphere, and from freezing, has been transported to other parts of the globe, and sown successfully raising living plants for conservatories and collections; those from the tropics being sedulously and carefully cultivated in hot-houses, kept at an uniform temperature the year round. Any one who may have become interested in this matter, may put it to the test by pursuing the plan here described, collecting the ripe dust from such species of ferns as may be within reach.

"That ferns are very beautiful, highly ornamental, and consequently attractive, will be admitted, but the utilitarian will be anxious to learn what are their uses? Such a querist will hardly receive a satisfactory answer if he confines the meaning of his word *use* to market value or to economic application. It is true that the *materia medica* derives small additions from ferns; a kind of food, in extreme cases, has been found in the stems of a very few species, but for clothing or shelter, resin, gum, oil, balsam, starch, dye-stuff, or any other product of the vegetable world which has its use and its market, none of these can be traced to ferns." (pp. 2, 3.)

A singular looking and rather pretty little fern, is the Adder's Tongue (*Ophioglossum vulgatum*), which has an erect stem six to twelve inches high, terminated by a club-shaped head, which is a modified leaf, or frond, and which is made up of the dust-cases or spores, such as usually grow on the back of the frond. Beside this, there is an expanded frond that is barren and devoid of spore-cases, and which looks not unlike the leaf of the dog's-tooth violet when half

grown. The old herbalists abroad attributed to the Adder's Tongue Fern rare virtues of healing, and even the poison of reptiles was supposed to be removed by its use. The Adder's Tongue is a native of this country, and I have met with it plentifully at Plymouth, and also at Hingham, where it was many years ago found by Mr. James S. Lewis of that town, and sparingly, there, in another section of the same town, by myself. The Moonwort (*Botrychium lunaria*) is another genus of the smaller British ferns, its spore-cases being so arranged on a stalk by themselves as to resemble a bunch of grapes. It is known there in this one species, but in the United States we have as many as five, four species besides the British, and several varieties. In England it has proved a difficult plant to cultivate, but I am assured by an eminent amateur in Ferns, that it grows readily when transplanted upon similar grassy land as that from which it was taken. Our *B. Virginicum* is a truly beautiful Moonwort and common in rich woods; and our *B. lunarioides* is subject to many curious variations. The Moonwort was especially a favorite with the witches, and Chaucer speaks of it as a choice herb with alchemists. The Osmund Ferns are showy and conspicuous, abroad represented in the Royal Fern (*Osmunda regalis*), and represented here in a slightly different form, growing, however, in similar situations, and deserving for beauty, grace, and bearing its regal name; beside this, we have two others, the Cinnamon Fern, and the Interrupted leaved Fern, well known to young botanists in the spring. The Polypods are ferns with elongated fronds, of which the common Polypody (*Polypodium vulgare*) is equally a British and a New England species. It is the pretty, evergreen, small fern which grows in matted tufts and beds, in the crevices and chinks of shaded rocks, and is readily cultivated on rock-work. Abroad, at least twenty varieties are known, of which the Saw-leaved (*P. serratum*) is the only one I have noticed growing wild here. Five other species are given, of which the Oak-polypody (*P. dryopteris*) and the Beech

Fern (*P. phegopteris*) are identical with ours. The Parsley Fern (*Allosorus crispus*) is a beautiful and "rather a local species, being found chiefly in mountainous localities in the north of England and Wales. Even there, a stranger may wander day after day and not meet with a plant for several days. The Parsley Fern is a very desirable plant for a Wardian case, or pot culture. It requires a little care in the cultivation, or it is apt to damp off from too much moisture at the roots. The fronds appear in May, and disappear with the early frosts of autumn." (pp. 52, 53.) We do not have this pretty fern, but it is represented in our *Allosorus acrostichoides*, or Rock-brake of Lake Superior, and of the northern and western parts of North America. The Jersey Fern (*Gymnogramma leptophylla*), found only in the island of Jersey as British, "is a little unpretending plant, of not more than two or three inches in height, and is not well suited to the Wardian case, growing most freely in the stove- (or hot) house. A native of Southern and Middle Europe, the isles of the Mediterranean and Northern Africa, it has also been found in Mexico." We are too far north for the *Gymnogrammas*, known as the Golden and Silver Ferns, and much cultivated for the beauty which a white or yellow mealiness on the back of the fronds gives them. "The Boss Ferns, or as they are sometimes called, Buckler Ferns, include some of the commonest and best known of British species. Their generally accepted botanical name is *Lastrea*. Most of the species are large and easily cultivated in pots or in the open air." Three of these have once divided fronds, four others have twice divided fronds, and one besides has thrice divided fronds. Of these the spiny Boss Fern is represented in our Shield Fern (*Aspidium spinulosum*) and its varieties, and the genus in other species is quite distinct. The British Shield Ferns, in the Holly Fern and Prickly Fern, have representatives with us, and there is one besides which we do not possess, and also another, finer than all, the *Aspidium acrostichoides*, common and beautiful,

evergreen all the year, easily cultivated, and worthy a search for it in shaded ravines and on bushy moist hill-sides. The soft Shield Fern is European, and of "this very sportive fern there are no fewer than sixty varieties, the handsomest of all is undoubtedly the *A. plumosum*, in which the fronds will reach nine inches in width, and nearly three feet in length; it has a spreading, plume-like habit, but is unfortunately a gem which is 'rare' as well as 'rich.'" A very common fern, but one of much delicacy, found with us in moist rich woods, and which in the autumn turns to a rich yellow and fades into nearly white; sought for winter boquets of dried leaves, is, for some unknown reason called abroad, the Lady Fern, and botanically, for a known reason, termed *Athyrium*, on account of a marked difference in the shape of the little scale, or *indusium*, which covers the spore dust on the back of its pretty fronds. It is the *Asplenium felix-femina* of our manuals, and one which is subject to great variation, having been considered, in one condition, a distinct species. It is easily cultivated and much esteemed in England, where it runs into many more varieties than with us, or so because these variations have not been so minutely noticed or carefully recorded. There are "sixty or seventy recognized varieties of this fern which are in cultivation; a few are attractive. The tasselled is one of the greatest favorites; the most singular is known by the name of *Frizellia*, in which the fronds are not an inch in width, with kidney-shaped leaflets divided into two parts, which overlap each other and are toothed at the edges; these are attached to each side of the leaf-stalk." Some pretty lines on this fern run to this measure:

"If you would see the Lady Fern,
In all her graceful power,
Go look for her where woodlarks learn,
Love songs in a summer bower.
But not by burn, in wood or dale,
Grows anything so fair,
As the plummy crests of emerald pale,
That waves in the wind, or sighs in the gale
Of the Lady Fern, when the sunbeams turn,
To gold her delicate hair."

The Spleenworts are all delicate and some are pretty little ferns, so-called on account of some supposed efficacy in the diseases of the spleen. They are technically called *Asplenium*, and although seven of the British species are unknown to our flora, yet we have two that are identical, and seven besides which are not British. The Wall-rue (*A. ruta-muraria*) may be found in our limestone cliffs, at Burlington, Vermont, and Trenton Falls, N. Y., and quite as pretty as in North Wales. The common Wall Spleenwort (*A. trichomanes*) is common about Salem under the shaded rocks of the Great Pasture, and known by its shining black leafstalks and simply pinnate oval leaflets. In England where it is plentiful, it is sometimes called the Maidenhair Spleenwort, a "not uncommon species being widely distributed over the British isles, but amongst rocks, old stone-walls and ruins it is most abundant. The walls of loose stones piled on each other, which skirt the roads in North Wales, are often green for miles with tufts of this fern." There are nine or ten varieties in cultivation, the most delicate being the *A. incisum*, the leaflets deeply cut, "each of which is like a fan of spreading, long, narrow lobes." In Scotland this fern had once some repute as a medicine for coughs and colds. For the British Sea Spleenwort, Rock Spleenwort, Bristly Spleenwort, Black Spleenwort, we must content ourselves with the New England and Western Pinnatifid, Ebony-stemmed in two species, the Mountain, the Narrow-leaved and the Thelypteris-like Spleenworts, which will reward the seeker, if haply he may find them all, and of some he cannot fail. But of the Hart's-tongue Fern, "found everywhere, on hedge banks, old walls, on the sides of wells, and in a variety of situations, accommodating itself to the various conditions in which it is placed; easily grown and indispensable both to the out-door fernery and the greenhouse, small plants growing with effect in a closed case;" the Hart's-tongue, I am fain to acknowledge is a very rare American fern, and oftener to be seen in greenhouses than in its native haunts.

It was discovered by Pursh among loose rocks near Onondaga in Western New York, more than fifty years ago; and long unknown until lately found under the limestone cliffs of Chitteningo Falls, in Pursh's locality, and elsewhere as in Canada West. It is a very interesting fern, the frond being like the blade of a knife, auricled or heart-shaped at base, the spore-dots in parallel lines on each side the midrib, reminding you of the Scolopendra, or Centipede, and is easily cultivated and grows readily from spores, as I can testify by actual experiment.

Thus esteemed and common in Great Britain, under cultivation, it has originated a good many varieties, such as the Crisp-fronded, the Crested, the Forked, the Proliferous, the Endive-leaved, the Rugged, the Broad-branched, the Kidney-shaped, and others with minute differences. Those, however, who prefer "nature unadorned" had better turn to Silliman's Journal, for May and September, 1866, and see there a full account of the American Hart's-tongue, identical, though it be, with the British, *Scolopendrium vulgare*, found elsewhere, and also flourishing in the Azores with other interesting species of those islands.

The Scale Fern (*Ceterach officinarum*) "sometimes called Rusty-back, because the whole under surface of the fronds are of a rusty-brown color, from the numerous brown scales which cover them," is a very nice affair, and though "widely distributed," fails us with its presence here. We must be content with many species which fail our British friends, who, so far as the Ceterach, with its ambiguous oriental name is concerned, is better off than we; but in their Hard Fern (*Blechnum*) we have a Southern species which will answer our purpose as well as their own; and then the *B. spicant* of Europe and England, has twenty or more varieties, which must be interesting to the amateur pteridologist or fern lover. The Bracken (*Pteris aquilina*) is a noble fern, only too common with us, who have no wild game and deer to seek a covert among it. The stem cut across exhibits the outline

of a double-headed eagle, as some imagine, whence its name, from *aquila*, or Eagle Fern, an Austrian conceit, perhaps. Its ashes are used by soap boilers and glass manufacturers. A fine native variety of this is the *caudata* of the Southern United States, with the segments, and especially the terminal ones, elongated; and two others beside are Southern. Thus there are three North American "brackens," and a variety in all three, to set against the British one. And as to our beautiful Maidenhair (*Adiantum pedatum*), which grows in the rocky ravines of Danvers, Salem, and its vicinity, we are told that it is "more hardy than the British, succeeding either in the open air or in a greenhouse," but I can aver that the *A. Capillus-Veneris* of England is a lovely fern, and a choice companion for its American sister.

The Bladder Ferns (*Cystopteris*) appear in three species in the British flora, and in two in ours; elegant ferns and easy of cultivation; one, the fragile Bladder Fern, creeping out of limestone and granite crevices alike, and from the interstices of old walls; and a bulb-bearing one furnished with the most cunning little green balls on the pinnæ. I have them both in cultivation, the former British too, but the Royal and the Mountain Bladder Ferns are not represented here; the latter is exceedingly pretty. The *Woodsias* are two, one identical with our own, the *W. Ilvensis*, a hairy little fern, which grows in woolly tufts, so patient of summer droughts on our sunburnt rocks. And against the Alpine *Woodsia* we must set three that are North American. The British Filmy Fern (*Hymenophyllum*); was there ever anything more delicate "on rocks which are continually moist or subject to the spray of water-falls, and not uncommon in rocky mountainous districts?" but it is principally represented in tropical regions in many species; in England in two, while another British Fern closely related to *Trichomanes radicans*, "on dripping rocks beneath the spray of water-falls, and confined to Ireland," is found in Alabama and Tennessee, with another and tiny species, its minute and

tender fronds sprinkled with spray, which was discovered by Peters, in Alabama, and dedicated to him as *T. Petersii*; occurring also in mosses sent from Pensacola, Florida.

Having thus cursorily glanced at the British types of the fern genera, and compared the species with our own, we leave to the amateur cultivator, to find in our botanical text books and manuals, many North American ferns beside, worthy attention and exclusively native here. That they have, however, received attention abroad, will be manifest by examining the list of "Exotic Ferns" appended to the main work we have had under consideration. In our Climbing Fern, *Aneimia*, *Nephrolepis*, *Onoclea*, Walking-leaf or *Camptosorus*, *Cheilanthes*, *Pellea*, *Vittaria*, and several *Polypodiums*, with the golden rhizomed *Acrostichum*, and the majestic Ostrich Fern, beauty, elegance, grace and novelty will be found.

THE FAUNA OF MONTANA TERRITORY.

BY J. G. COOPER, M. D.

THE following notes refer to animals collected or seen in the Rocky Mountains, between Fort Benton, Fort Colville, and Fort Vancouver, Washington Territory, July 1st to November 1st, 1860.

I. MAMMALS.

BAT (*Vespertilio*, species? No. 68 in alcohol). I found this Bat under the bark of a dead tree in Hell Gate valley, over 4,500 feet above the sea. It had been flying about a little in the bright sunlight an hour before it set, but returned to this shelter as if dazzled, though it could see plainly enough where to find a dark place. I saw no other during the journey that I can now recollect.

SHREWS (*Sorex*, *Blarina*, etc.). I mention these here,